# Fisher<sup>™</sup> FIELDVUE<sup>™</sup> DVC6200f Digital Valve Controller PST Calibration and Testing using ValveLink<sup>™</sup> Software

The test procedure contained in this Instruction Manual Supplement is to be considered as a guideline only and should be modified to address site-specific requirements. Use this procedure in conjunction with the DVC6200 Series quick start guide (D103556X012) and the DVC6200f instruction manual (D103412X012). In addition, exercise good engineering practices and abide by specific plant safety guidelines for safe operation.

For additional information on Partial Stroke Testing and associated parameters refer to Partial Stroke Test Information on page 19.

# **PST Calibration**

This document covers the basic PST calibration, as well as details for making adjustments to the normal end, using Advanced Settings (see figure 11).

Figure 1. Calibration > Partial Stroke





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## Figure 2. Set Transducer Block to Manual

ValveLink S	oftware
?	The Transducer Block Actual Mode must be MANUAL to complete this task. To change the Block Mode, from main menu select Instrument Setup   Mode   Block menu. Do you wish to change the Block Mode now?
	<u>Y</u> es <u>N</u> o

Change Transducer Mode				
STOP	Set to MANUAL			
Warning!	Advanced			
Valve may move.	Cancel			
Valve will no longer follow loop setpoint.	<u>H</u> elp			

	Enton the	Decine	Outasina	Dama Da	+~
rigule 5.	cinter the	Desire	Outgoing	каттр ка	ιe

Partial Stroke Calibration	— Supports separate ramp
	rates for outing and incoming strokes
Step 1 Please enter the desired OUTGOING ramp rate:	
© 1.00 %/s	
© 0.50 %/s	
© 0.12 %/s	
© 0.06 %/s	
< <u>B</u> ack Cancel Help	

Figure 4. Enter the Desired Incoming Ramp Rate

Partial Stroke Calibration	
Step 2 Please enter the desired INCOMING ramp rate:	Additional ramp rates for the incoming stroke
◎ 4.00 %/s	
© 2.00 %/s	
© 1.00 %/s	
© 0.50 %/s	
© 0.12 %/s	
© 0.06 %/s	
< <u>B</u> ack <u>N</u> ext > Cancel Help	

## Figure 5. Enter the Minimum Travel Movement

Partial Stroke Calib	oration	x
Step 3	Please enter the Minimum Travel Movement:	
	15 %	
	< Back Next > Cancel H	Help

Figure 6. Partial Stroke Calibration progress

Partial Stroke Calibration Progress		
Moving to Partial Stroke Start Point		
Travel: 100.02 %		
33%		
	Cancel	

Partial Stroke Calibration Progress	
Running Calibration Test. Outgoing Ramp Rate: 0.25 %/s	
Travel: 97.36 %	
60%	
	Cancel

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#### Figure 7. Partial Stroke Calibration progress



Figure 8. Step or Ramp to Normal Position on Failed PST

Partia	al Stroke Cali	bration	x
	Step 4	On a failed PST, step back or ramp back to the normal position?	
		<ul><li>● Step</li><li>○ Ramp</li></ul>	
		<back next=""> Cancel</back>	Help

#### Figure 9. Partial Stroke Calibration Progress



#### Figure 10. Calibration Procedure Complete

ValveLink Software	
The following values were written during PST Calibration: Outgoing Ramp Rate: 0.25 %/s Incoming Ramp Rate: 0.25 %/s Travel Low End: 4.00 % Travel High End: 96.05 % Additional Partial Stroke Test Parameters and Acceptance Criteria have been written to the device.	List of parameter values being downloaded to the device
ОК	
ValveLink Software	
The calibration procedure is completed.	
ОК	

If you need to make adjustments to the normal end default settings, select Advanced Settings, as shown in figure 11, and make the necessary adjustments.

Partial Stroke Calibration	
WARNING         Calibration procedures may result in a sudden change in the valve position, and loss of process control.         DO NOT continue until the instrument and the associated valve are isolated from the process.         Image:	Select to define the normal end

## Figure 11. Select Advanced Settings to Make Adjustments to the Normal End

Figure 12. Set Travel High End

Partial Stroke Calibration	X	Defines the
Step 4 Travel High End		end of travel
< <u>Back</u> <u>N</u> ext > Cance	el Help	

#### Figure 13. Enter Minimum Travel Movement

Partial Stroke Cali	bration	×
Step 3	Please enter the Minimum Travel Movement:	
	< <u>B</u> ack <u>N</u> ext > Cancel He	lp

If Minimum Travel Movement + Set Point Overdrive is more than Maximum Allowable Travel then the below message is presented and you are directed to the next screen as shown in figure 14



## Figure 14. Review Inputs

Partial Stroke Calibration	
Step 3     Please enter the Minimum Travel Movement:       50     %       Please enter the PST Overdrive Amount:       10     %       Please enter the Maximum Allowable Travel:       30     %	Minimum Travel Movement + PST Overdrive Amount is greater than the Maximum Allowable Travel
< <u>Back</u> Cancel Help	

Figure 15. Enter New Maximum Allowable Travel

Partial Stroke Calibration	
Step 3       Please enter the Minimum Travel Movement:         50       %         Please enter the PST Overdrive Amount:         10       %         Please enter the Maximum Allowable Travel:         70       %          Z          %	Enter a value greater than Minimum Travel Movement + PST Overdrive Amount

Figure 16. Partial Stroke Calibration Progress

	Partial Stroke Calibration Progress
	Running Calibration Test. Outgoing Ramp Rate: 0.25 %/s
	Travel: 41.41 %
	60%
	Cancel
U	

# Configuration

After successfully calibrating the valve for PST go to the Detailed Setup FST/ PST tab and verify that the values for the parameters in the Valve Stroke Test group box are correct. Then go to the Partial Stroke group box and enable any of the behaviors required for the PST.

Figure 17. Verify FST/PST Values

ValveLink Software - Detailed	Setup - 0051004602FISHERD\	VC0902114421687
		s <u>S</u> pec Sheet T <u>o</u> ols C <u>u</u> stomize ValveLink <u>H</u> elp
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ValveLink Solo Version 13	Dataset: <new></new>	
NI Card	Page Group: Transducer Block	
Database		
_	Proximity Alerts ? « Initial Setup Tuning	Config Alerts ? « Sensor Alerts Performance Alerts ? Travel History Alerts g? <b>&lt; FST/PST</b> Auto PST ? Local Control Panel ? Instrument Tag and Units ?
	Parameter	
	Valve Stroke Test (FST/F	PST)
	Valve Stroke Test:	Partial Stroke Test
	Test Start Point:	Valve Open
	Travel High End:	96.07
	Travel Low End:	4.00
	Test Pause Time:	43.68
	High Friction Breakout Press:	1.46
	Low Friction Breakout Press:	2.76
	Action on Failed Test:	Step Back
	Full Stroke	
	Ramp Rate:	2.00
	Wait Time:	30.00
	Breakout Timeout:	43.68
	Partial Stroke	
	Maximum Allowable Travel:	30.00
	Minimum Travel Movement:	10.00
	Set Point Overdrive:	10.00
	Freeze Analog Feedback:	Finable
	Freeze Discrete Feedback:	Enable
	Minimum PST Pause Time:	Enable
	Randomized PST:	Enable
	Randomization:	0.00
	Outgoing Ramp Rate:	0.25
	Incoming Ramp Rate:	0.25
	Return Lead:	0.73
	Breakout Timeout:	21.84
	Outgoing Pressure Threshold:	0.99

Once the PST has been setup and calibrated go to the VST Abnormal Criteria group box and select the criteria to be used to evaluate PST after they are run. Then, select the criteria to be used to abort a PST immediately on initiation, and the criteria to be used to prohibit a PST before initiation.

#### Figure 18. Select VST and PST Criteria

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Card Dataset: <new></new>				
0051004602F Page Group: Transducer Block				$\longrightarrow$
tabase Proximity Alerts ?	Config Alerts ?	« Sensor Alerts	Performance Alerts ?	Travel Histor
	ig? <fst ps<="" th=""><th>T Auto PST ? Local I</th><th>Control Panel ? Instrument</th><th>Tag and Units ?</th></fst>	T Auto PST ? Local I	Control Panel ? Instrument	Tag and Units ?
Parameter Randomized PST:	Instrument Enable			
Randomization:	0.00			/
Outgoing Ramp Rate:	0.00			
Incoming Ramp Rate:	0.25			
Return Lead:	0.73			
Breakout Timeout:	21.84			
Outgoing Pressure Threshold:				
Incoming Pressure Threshold:				$\rightarrow$
VST Abnormal Criteria				
Breakout Time:	Enable			
Incoming Pressure Threshold:	Enable			
High Friction Breakout Press:	🔽 Enable			
Low Friction Breakout Press:	🔲 Enable			$\langle$
VST Abort Criteria				
Breakout Time:	🔽 Enable			
Outgoing Pressure Threshold:	🔽 Enable			
Incoming Pressure Threshold:	I Enable			$\backslash$
High Friction Breakout Press:	🗹 Enable			
PST Prohibited				
Check Alert:	🔽 Enable			
Drive Current:	🔽 Enable			
Drive Signal:	🔽 Enable			1
Processor Impaired:	💌 Enable			
Travel Sensor:	🔽 Enable			
Output Pressure Sensor:	🔽 Enable			
Supply Pressure Sensor:	🗹 Enable			
Temperature Sensor:	🔽 Enable			
Supply Pressure:	🔲 Enable			
Temperature Limit:	Enable			
Travel Deviation:	Enable			
Pressure Fallback Active:				/

Categorize the stroke alerts from the Valve Stroke Alerts tab into one of the Field Diagnostic Alert categories and suppress them if publishing on the segment is not desired.

#### Figure 19. Set Valve Stroke Alerts



# Initiating a PST Diagnostic

If an Auto PST is desired then go to the Auto PST tab and set up the PST schedule. The instrument will present a message when the next PST becomes due. If a scheduled PST is not initiated then a PST overdue alert is generated.

#### Figure 20. Setting Auto PST



To run a manual PST select the Partial Stroke Test icon as shown in figure 21.

#### Figure 21. Initiating a Manual PST

V ValveLink Software - Partial S	troke Test/Demand and Reset	Data - 0051004602FISHER	RDVC0902114421687			
Tag Network Instrument Se	tup Cali <u>b</u> ration <u>D</u> iagnostics		ustomize ValveLink <u>H</u> elp			
	י ד 🔍 🖌 🖁 🗞	/ 4 🖩 🗾	# Ø			
ValveLink Solo Version 13	Datasets: <a href="https://www.englight.com">https://www.englight.com</a>				•	Spec Sheet
						Read Save
⊡ ⊒ Database	Inputs Configuration Graph	Data Points Analyzed No	otes Valve Trim Actuator	Reference		
	Test Start Point:	100.0 %				
	Test End Point:					
	Outgoing Ramp Rate:					
	Incoming Ramp Rate:					
	Test Pause Time:					
	Partial Stroke Pressure Limit:					
	Collection Interval:					
	Max Allowable Travel:	30.0 %				
	Run Diagnostic Save Dataset	Delete Dataset	Mark <u>G</u> olden			<u>C</u> lose Tag <u>H</u> elp
0051004602FISHERDVC090211442	21687				(1)	рет 🧝 🦉 🤹

#### Figure 22. Upload or Delete Saved Partial Stroke Diagnostics

These Partial Stroke diagnostics ar Select a diagnostic to upload or	
14 Sep 2016 15:56:26	Not In Database
14 Sep 2016 16:03:59	Not In Database
19 Aug 2016 14:54:41	Not In Database
13 Sep 2016 11:02:25	Not In Database
15 Sep 2016 11:04:23	Not In Database
22 Sep 2016 13:14:29	Not In Database
22 Sep 2016 14:35:04	
14 Sep 2016 07:53:40	Not In Database
14 Sep 2016 12:23:33	Not In Database
14 Sep 2016 12:32:58	Not In Database
14 Sep 2016 12:24:34 Trigger	Not In Database
14 Sep 2016 15: 19:07 Trigger	Not In Database
14 Sep 2016 15:17:34 Trigger	Not In Database

Before the manual PST initiates, you are given the opportunity to upload and save the instrument diagnostic data to ValveLink software. Select the datasets that are Not In Database and upload. Deletion of the data from the instrument is not necessary as new data will overwrite the oldest dataset. Datasets that are not uploaded to ValveLink software will not be accessible in the instrument once they are overwritten by new data

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## Figure 23. Partial Stroke Test Progress

Partial Stroke Test - Progress	
Reading device configuration.	Outgoing Stroke
Moving to 80.00 %.	
4%	
Cancel	
Partial Stroke Test - Progress	
Reading device configuration.	Incoming Stroke
24%	
Cancel	

#### Figure 24. PST Analyzed Data

Iag Network Instrument Setup Calibration Diagnostics Spec Sheet Tools Cystomize ValveLink Help 🕣 🔞 🥸 📓 🚏 🔊 晶 🥖 🔎 🖉 Ґ 🔣 🗮 刘 😻 🖉	
└─ @ ゑ ॼ ! ┺/ 國 / /# J / ~? ⊞ > // (2)	
Large ValveLink Solo Version 13 Detasets: Knew> Spec Sheet	
Press NI Card Read Save	
B-B Database Inputs   Configuration   Graph   Data Points   Analyzed   Notes   Valve   Trim   Actuator   Reference	
Zero Ranged Travel at: -3.48 %	
Full Ranged Travel at: 100.78 %	
Average Dynamic Error: 0.76 % Maximum Dynamic Error: 1.13 %	
Minimu Dynamic Eror: 0.30 %	
Dynamic Linearity (Ind): 0.15 %	
Average Torque: 68 lbf.in	
Maximum Torque: 76 lbf.in	
Minimum Torque: 60 lbf.in	
Spring Rate: 228.13 lbf/in	
Bench Set: 7.58 - 34.97 psi	
- PST Result	
PST/Demand/Reset initiated by: Command	
PST/Demand/Reset status: Succes	
Task Type: Executed by PST/Demand/Reset View	
Task Type. Executed by 137/Deman/Treset view	
Max Travel Reached: 10.19 %	
Time to Achieve Max Travel: 39.54 sec	
Breakout Pressure: 30.36 psi Breakout Time: 14.59 sec	
Breakout Time: 14.59 sec Test Completion Time: 64.82 sec	
Run Diagnostic Save Dataset Delete Dataset Upload Mark Golden Disse Tag He	lp
0051004602FISHERDVC0902114421687 🗊 😰 🌌 🦉	<u></u>









A PST Diagnostic can be run with Minimum PST Pause Time disabled, as shown in the figure below. When Minimum PST Pause Time is disabled the pause time will be in effect when the valve reaches the desired test point, resulting in a slower PST.

Figure 27. Disable Minimum PST Pause Time in FST/PST Partial Stroke

ag <u>N</u> etwork Instrument S		Spec Sheet Tgols Cystomize ValveLink Help	
ValveLink Solo Version 13	Dataset: <new></new>		
NI Card	Page Group: Transducer Block		
Q 0051004602F			$\rightarrow$
-	Proximity Alerts ? Initial Setup	Config Alerts ? Config Alerts ? Travel History Alerts ? Travel History Alerts ? ? <pre></pre>	Pressure/Tempera MAI Channels ?
		rs <u>«FST/FST</u> Addresses Local Contor Pares : Instrument ragiand onis : Instrument : Instrument	
	Valve Stroke Test (FST/P		7
	Valve Stroke Test:	Partial Stroke Test	
	Test Start Point:	Valve Open	/
	Travel High End:	96.07	*
	Travel Low End:	4.00	*
	Test Pause Time:	43.68	sec 🗲
	High Friction Breakout Press:	1.46	bar 🗲 🛓
	Low Friction Breakout Press:	2.76	bar 🗲 🔿
	Action on Failed Test:	Step Back	
	Full Stroke		
	Ramp Rate:	2.00	%/sec 🗲
	Wait Time:	30.00	sec 🗲
	Breakout Timeout:	43.68	sec
	Partial Stroke		$\langle$
	Maximum Allowable Travel:	30.00	*
	Minimum Travel Movement:	10.00	× ~
	Set Point Overdrive:	10.00	× ~ A
	Freeze Analog Feedback:	Enable	
	Freeze Discrete Feedback:	Enable Minimum PST Pause	
	Minimum PST Pause Time:	Enable Time disabled	
	Randomized PST:	Enable	
	Randomization:	0.00	x 📼
	Outgoing Ramp Rate:	0.25	%/sec <=
	Incoming Ramp Rate:	0.25	%/sec 🔄
	Return Lead:	0.73	× 🛋
	Breakout Timeout:	21.84	sec 🗲
	Outgoing Pressure Threshold:	0.99	bar 🗲 🔿
	Incoming Pressure Threshold:	2.67	bar 🔶 🔿
	VST Abnormal Criteria		
	Breakout Time:	🔽 Enable	
	Incoming Pressure Threshold:	🔽 Enable	← →
	High Friction Breakout Press:	🔽 Enable	
	Low Friction Breakout Press:	Enable	~
4 m	Save Dataset Beset I	Dataset Delete Dataset Cogy From Tag	
104602FISHERDVC09021144			



#### Figure 28. Resulting Press/Tvl Graph Results with Minimum Pause Time Disabled

Figure 29. Resulting Tvl/Time Graph Results with Minimum Pause Time Disabled



Iag       Network       Instrument Setup       Calibration       Diagnostics       Spec Sheet       Tools       Customize ValveLink       Help         Image: Spec Sheet       Image: Spec Sheet       Image: Spec Sheet       Image: Spec Sheet       Spec Sheet       Read         Image: Spec Sheet       Image: Spec Sheet       Image: Spec Sheet       Image: Spec Sheet       Read	
La ValveLink Solo Version 13 Datasets: 22 Sep 2016 14:40:32	
La ValveLink Solo Version 13 Datasets: 22 Sep 2016 14:40:32	
Detasets: 22 Sep 2016 14:40.32	
🖻 🚓 Ni Card Read	
	Save
Database     Inputs Configuration Graph Data Points Analyzed Notes Valve Trim Actuator Reference	
Zero Ranged Travel at: -1.46 %	
Full Ranged Travel at: 100.51 %	
Average Dynamic Error: 0.78 % Maximum Dynamic Error: 1.07 %	
Marinum Dynamic Error: 1.07 %	
Dynamic Lindi, 101, 0.13 %	
Average Torque: 71 Ibf.in	
Maximum Torque: 80 bf.in	
Minimum Torque: 65 lbf.in	
Spring Rate: 225.33 lbf/in	
Bench Set: 11.93-34.68 psi	
PST/Demand/Reset initiated by: Command	
PST/Demand/Reset status: Success	
Task Type: Executed by PST/Demand/Reset View	
Max Travel Reached: 20.17 %	
Time to Achieve Max Travel: 40.14 sec	
Breakut Pressure: 30.33 psi	
Breakout Time: 15.07 sec	
Test Completion Time: 188.53 sec	
( III ), Bun Diagnostic Save Dataset Delete Dataset Upload Mark Golden Qost	e Tag Help
	-
051004602FISHERDVC090211421687 🜗 🔮 PST 🆧	🧧 🧐

Figure 30. PST Analyzed Data with Minimum Pause Time Disabled

Select a PST style, either with or without Minimize PST Pause Time, and standardize on that style, as the data may be difficult to compare between the two styles. If the desire is to minimize the amount of time the valve is away from the normal end, then enabling Minimize PST Pause Time is recommended. If the amount of time away from the normal end is not a concern, then disabling Minimize PST Pause Time will cause the set point to pause at the end of the outgoing stroke for the travel to catchup to the set point. The results of the test with the Minimize PST Pause Time disabled will be similar to the PST as offered in earlier versions of SIS instruments.

# Partial Stroke Test Information

#### Valve Stroke Test

A valve stroke test is the process of taking the valve from the normal end to another target position at a preconfigured ramp rate before returning to the normal end while gathering data. The data is analyzed to evaluate the condition of the valve assembly against a set of user defined thresholds. A valve stroke test is only run if everything is normal in the instrument. A safety demand signal will always take precedence over a valve stroke test.

- Valve Stroke Test, select Partial Stroke Test, Full Stroke Test, or Disable to select the test to run when the test is initiated using the VST\_COMMAND parameter.
- Partial Stroke Start Point defines the normal end of the valve. The valve needs to be at this end for a PST to be initiated. When a FST is initiated the valve will be moved by the test to this end before being ramped to the opposite end and ramped back. Setting this value to Not Configured will disable partial stroke tests.

- Travel Open End defines, in percent (%) of calibrated travel, the point above which the valve is considered to have reached the high end.
- Travel Closed End defines, in percent (%) of calibrated travel, the point below which the valve is considered to have reached the low end.
- Test Pause Time is the time between the outgoing and incoming strokes of the test. The default value is 5 seconds. Pause Time will not be used if Minimum PST Pause Time is enabled. The outgoing stroke is from the normal end to the PST target and the incoming stroke is the return stroke to normal. See figure 31.
- VST High Friction Breakout Pressure indicates that the breakout required a higher force than configured by the user. Refer to figure 31.
- VST Low Friction Breakout Pressure indicates that the breakout required a lower force than configured by the user. Refer to figure 31.
- Action On a Failed Test defines if the valve should step or ramp back on a failed stroke test.

Figure 31. Valve Signature Representation



#### VST Abnormal & Abort Criteria

#### • VST Abnormal Criteria

**① SUPPLY PRESSURE** 

A partial stroke test is marked as abnormal if it fails one of the following criteria.

The device always evaluates a PST on the following criteria:

1. Target Travel achieved

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2. Return to the normal end

In addition to the above, any of the following can be selected to evaluate a Partial Stroke Test.

- 1. Breakout Time
- 2. Outgoing Pressure Threshold
- 3. Incoming Pressure Threshold
- 4. High Friction Breakout Pressure
- 5. Low Friction Breakout Pressure
- VST Abort Criteria

The PST is terminated and the valve is returned to the normal end. The return to the normal end will be per the user configuration for an aborted test. The abort criteria will only be active if it is added as a criteria to be evaluated during PST by adding it to the PST Abnormal Criteria.

The device always aborts a PST if the Max Travel displacement is exceeded.

In addition to the above, any of the following can be selected to abort a Partial Stroke Test:

- 1. Breakout Time
- 2. Incoming Pressure Threshold
- 3. High Friction Breakout Pressure

#### Partial & Full Stroke

• Partial Stroke

PST Max Travel defines how much travel displacement is allowed before the PST aborts (see figure 32).

**PST Minimum Travel** is the percentage of total span that the valve moves away from its normal operating end of travel towards its tripped end of travel during the test. The default value is 10%.

Set Point Overdrive defines the extent of the set point overdrive over the Minimum Travel Movement when the early turn around is enabled. When the early turn around is not enabled it defines the travel target.

Freeze Analog / Discrete Feedback when enabled, freezes the corresponding feedback during a partial stroke test.

Minimum PST Pause Time, when enabled, the incoming stroke is initiated as soon as the travel reaches the minimum travel movement. Refer to figure 32 for a time series representation of this parameter.

Randomized PST, when enabled the instrument randomizes the target travel, for each PST.

**PST Randomization** is defined in percent (%) of calibrated travel span, it defines the extent of randomization from the minimum travel movement towards the normal end. If the user defined randomization is too large the instrument will cap the max randomization to ensure that there will be at least 1% travel movement away from the defined normal end. Refer to figure 31.



**Outgoing Ramp Rate** is the rate at which the valve will move during the Outgoing stroke of the Partial Stroke test. The default value is 0.25%/second.

**Incoming Ramp Rate** is the rate at which the valve will move during the Incoming stroke of the Partial Stroke test. The default value is 0.25%/second.

**PST Return Lead** defines the percent (%) change in setpoint to overcome the hysteresis in the valve assembly. The error between setpoint and actual error is added to this percent change. For example, if the Return Lead is set at 0.5% and there is a 1% error this will be set at 1.5%

**PST Breakout Timeout** is the user configured amount of time before which the valve must leave the normal end during a PST.

VST Outgoing Pressure Threshold defines the actuator pressure at which a partial stroke test will abort during the outgoing stroke (see figure 31). This prevents the DVC6200f from exhausting (or building) excessive pressure from/to the actuator in an attempt to move a stuck valve. During PST Calibration, the Partial Stroke Outgoing Pressure Threshold will be set automatically.

VST Incoming Pressure Threshold defines the actuator pressure at which a partial stroke test will abort during the incoming stroke (see figure 31). This prevents the DVC6200f from exhausting (or building) excessive pressure from / to the actuator in an attempt to move a stuck valve.

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• Full Stroke

Full Stroke Ramp Rate is the rate at which the valve will move during the full stroke test.

**FST Wait Time** is the amount of time to wait for the valve to move to the normal end after initiation of the full stroke test.

Full Stroke Breakout Timeout is the user configured amount of time before which the valve must leave the normal end during a full stroke test.

## **PST** Prohibited

A partial stroke test will not be initiated if any of the following user-configurable conditions are active:

- 1. Check Bit Alert
- 2. Drive Current
- 3. Drive Signal
- 4. Processor Impaired
- 5. Travel Sensor
- 6. Output Pressure sensor
- 7. Supply Pressure Sensor
- 8. Temperature Sensor
- 9. Supply Pressure
- 10. Temperature Limit
- 11. Travel Deviation
- 12. Pressure Fallback
- 13. PST Abnormal

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